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ABSTRACT

Noting that maternal depression is common during a baby's first year, this study examined the interaction of depressed and non-depressed mother-child dyads. A sample of 26 first-time mothers with postpartum depression at the third month after birth and their 3-month-old infants was compared to a sample of 25 first-time mothers with no postpartum depression at the third month after birth and their 3-month-old infants. The observations were repeated at 6 months and again at 12 months postpartum. The samples were compared for differences in mother interaction behavior, mother's infant care, mother's concern with the baby, infant behavioral difficulties, infant mental and motor development, and infant behavior with the observer. Among the findings are the following: (1) depressed mothers' interaction behavior and care of their infants are less adequate than the non-depressed mothers' interaction behavior and care of their infants at 3, 6, and 12 months postpartum; (2) infants' interaction behaviors during feeding and face-to-face interaction with depressed mothers are less adequate than infants' interactions with non-depressed mothers at 3, 6, and 12 months postpartum; (3) mother-infant interactions are less adequate in the depressed mother dyads than the non-depressed dyads at 3, 6, and 12 months postpartum; (4) depressed mothers are less concerned about their infants than non-depressed mothers at 3, 6, and 12 months postpartum; (5) infants of depressed mothers have more behavioral difficulties at 3, 6, and 12 months postpartum than infants of non-depressed mothers; (6) infants of depressed mothers had lower mental and motor development rates at 6 and 12 months postpartum than infants of non-depressed mothers; and (7) infants of non-depressed mothers behaved in a more positive way with the observer than the infants of depressed mothers. (AS)

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POSTPARTUM DEPRESSION: IS IT A CONDITION AFFECTING THE MOTHER-INFANT INTERACTION AND THE DEVELOPMENT OF THE CHILD ACROSS THE FIRST YEAR OF LIFE ?

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ABSTRACT

During the child's first year of life, maternal depression is a very common situation. It affects family life in a variety of ways, including mother-baby interaction and child development.

This study compares the interaction of depressed and non-depressed dyads and analyses the effects of maternal depression on child development at 3rd, 6th and 12th month postpartum.

A sample of 25 primiparious depressed women and their infants was compared with a control matched group of 25 primiparious non-depressed women and their child.

The results showed that mother-infant interaction and the way the mother organises the environment and the care of the baby are poorer and less adequate in dyads where the mother is depressed than in then non-depressed counterparts. There is also a number of adverse effects in infant and family due to maternal depression, such as a poor motor and mental development, a less adjusted behaviour and signs of adaptation difficulties.

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1. Introduction

Epidemiological studies have been clearly and consistently showing that the longest numbers of depressive disorders occur in women than in men (DSM-IV, 1995), especially in married women, aged between 25 to 45 years-old, with a small child (Paykel, 1991). In spite of this, only recently empirical studies have been done in postpartum depression, the first of them in 1968 by Pitt.

From this study, the clinical picture of postpartum depression has been by general consent described by several authors and more recently times re-examined (e.g., Cooper, Murray & Stein, 1991; Séguin & Cossette, 1991; O'Hara & Zekoski, 1988).

This clinical picture shows a depressive state, in a total absence of psychotic symptomatology, occurring in about 10 to 20% of mothers, on their 2^{nd} or 3^{rd} month after giving birth, going on for some months and rarely growing on importance to the point of needing psychiatric hospitalisation (e.g., Campbell, Cohn, Flanagan, Popper, & Meyers, 1992; Cooper, Campbell, Day, Kennerley, & Bond, 1988; Gotlib, Wiffen, Wallace, & Mount, 1991; O'Hara, Zekoski, Philipps, & Wright,1990).

2. Interest in postpartum depression study has been currently referred, especially because of this high incidence — namely, in specific samples, such as in the case of socio-economic disadvantaged women (e.g., Hobfoll, Ritter, Lavin, Hulsizer, & Cameron, 1995) or adolescent women (e.g., Cutrona, 1990; Leasbeater & Linares, 1992) the rate of postpartum depression reaches to impressive values — and because of the adverse effects in mother-infant interaction and child behaviour and development.

3. During the last decade, some investigators made strong efforts to ascertain which could in fact be the effects and sequels of postpartum depression on infant development having found ill-effects at different levels.

At the level of <u>mental and motor development</u>, because such children showed lower rates of mental and motor development during the first year of life, when compared to children whose mothers have not experienced depression after giving birth (e.g., Cogill, Caplan, Alexandra, Robson, & Kumar, 1986; Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986; Sameroff, Seifer, & Zax, 1982).

At the level of establishing a secure affectionate relationship with the mother (secure <u>attachment</u>), because a significant number of

infants of women experiencing postpartum depression showed a pattern of insecure attachment to their mothers (e.g., Cohn, Campbell, & Ross, 1991; Lyons-Ruth, Connell, Grunebaum, & Botein, 1990; Lyons-Ruth, et al., 1986; Murray, 1992; Radke-Yarrow, Cummings, Kuczinsky et al., 1985).

At the level of interpersonal behaviour, because a large number of such children showed deranged, troubled or poorer forms of relationships with peers and adults (e.g., Caplan, Cogill, Alexandra, Robson, Katz, & Kumar, 1989; Carro, Grant, Gotlib, & Compas, 1993; Lyons-Ruth, Alpern, & Repacholi, 1993; Murray & Stein, 1991, Sameroff et al., 1982; Sharp, Hay, Pawlby, Schmucker, Allen, & Kumar, 1995; Shaw & Vondra, 1995; Stein, Gath, Bucher, Bond, Day, & Cooper, 1991; Wraté, Rooney, Thomas, & Cox, 1985).

4. Not long ago, others investigators working on the field of postpartum-depressed mother-infant interaction pointed out some relevant differences between dyads whom the mother is or is not depressed.

Postpartum depressed mother shows a lower number of positive facial expressions (e.g., Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Field, 1984; Field, Healy, Goldstein, & Gutherz, 1990; Livingood, Daen, & Smith, 1983; Sameroff et al., 1982) and a higher number of negative facial expressions (Cohn, Campbell, Matias, & Hopkins, 1990; Field, 1984; Lyons-Ruth, et al., 1986); vocalises less (Field, 1984; Field, Sandberg, Garcia, Vega-Lahr, Goldstein, & Guy, 1985; Fleming, Flett, Ruble, & Shaul, 1988; Sameroff et al., 1982), more slowly and does not exaggerate in voice modulations (e.g., Bettes, 1988; Murray & Stein, 1991); offers less behaviours of affectionate physical contact with baby (Campbell et al., 1992; Sameroff et al., 1982; Field, 1984; Field et al., 1985; Fleming et al., 1988; Lyons-Ruth et al., 1986; Murray & Stein, 1991); spends less time looking at and contemplating baby (Field, 1984; Field et al., 1985; Livingood et al., 1983).

Infant of postpartum depressed mothers shows a lower number of positive facial expressions (e.g., Cohn et al., 1990; Field, 1984) and a higher number of negative facial expressions and negative responses (Cohn et al., 1990; Field, 1984; Field et al., 1990; Stein et al., 1991),e.g., Field, 1984), vocalises less (Field, 1984; Field, Morrow, & Adlestein, 1993; Stein et al., 1991), is less attentive and looks less at mother (Cohn et al., 1990; Field, 1984; Field et al., 1990, 1991; Stein et al., 1991). It must be said that Tiffany Field and his assistants not only described a typical interactive

pattern of the depressed mother's infant, as they confirmed that such pattern kept when the baby interacted with a non depressed adult, and further confirmed that the action of the adult was less adequate when in presence of such an infant, comparatively to what occurred when the adult interacted with a non depressed mother's infant (Field, Healy, Goldstein, Perry, Bendell, et al. 1988).

In postpartum depressed mother and baby dyads the number of contingencies' responses is lower (e.g., Bettes, 1990; Field et al., 1984; Field et al., 1990); the periods of mother-baby mutual attention are less abundant (e.g., Field et al., 1990); mother and baby shared more state of negative affect than state of positive affect (Cohn, et al.,1990; Field, Healy, & LeBlanc, 1989).

The aims of the present study are: a) to characterise mother-infant interaction in cases where the mother is postpartum depressed; b) to evaluate possible adverse repercussions of the mother's depressive condition on infant's behaviour and development; c) to evaluate possible negatives' repercussions of infant's behaviour and development and family's conditions on postpartum depression recovery.

The present study hypotheses are:

1) in the case of postpartum depression mothers the mother-infant care and interaction is less adequate than in the case of no psychiatric morbidity mothers.

2) infants of postpartum depressed mothers have lower levels of mental and motor development, more behaviour difficulties and less adequate behaviour with the observer than infant of no psychiatric morbidity mothers

3) in negative conditions of infant and family, postpartum depression recovery is more difficult than in positive infant and families conditions

This paper will only present the results referring to the first and second aim and the first and second hypotheses of the study.

2. Method

2.1. sample

The sample comprised 51 mothers and their 3 month-old infants: the experimental group — 26 first-time mothers who showed depressive disorder at the third month after birth — *major/minor* depression (RDC) and the control group — 25 first-time mothers with no depressive

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disorder or other psychiatric morbidity, matched accordingly a set of variables significant for the study: mother's age, marital state, years of education, occupational level, baby's sex and family' social class.

2.2. procedures and measures

1. A letter was sent to all families who registered a baby in a Civil Registration Office in Porto (Portugal) during 1989, by the time the baby was three months old. In that letter, first-time mothers were asked to reply and return, an identification questionnaire and the Portuguese version of the self-administration scale designed by Cox, Holden, and Sagovsky (1987) to detect postpartum depression — The Edinburgh Postnatal Depression Scale, E.P.D.S. (Augusto, Kumar, Calheiros, Matos, & Figueiredo, 1992).

2. Mothers were contacted on the phone and a first meeting was arranged. They were told that it was a study on mothers and babies that would take 3 home visits until the child would be one year old.

3. When the babies were 3-4 months-old, two trained observers (A and B) — to have independent measures of the dependent and the independent variables — went to the families' home for the first evaluation, which comprised the following steps.

Psychologist A fulfil with the mother the Schedule for Affective Disorders and Schizophrenia, SADS (Endicott & Spitzer, 1978), which allowed the diagnosis of the mother's mental health state, with the Research Diagnostic Criteria, RDC (Spitzer, Endicott, & Robins, 1978); administrate to the mother some specific items of Social Adjustment Scale — Self-Report Version, SAS-R (Weissman, Paykel, & Prusoff, 1985); and administrate to the father the Scale of Infant Father Care, which evaluate the participation of the father in a series of relevant activities to the care of the baby (Figueiredo, 1997).

Psychologist B administrate the 3 scales designed by Bayley for the infant assessment, respectively to evaluate the infant's mental and motor development and to record the infant's behaviour toward the observer — Bayley's Scales of Infant Development (Bayley, 1969). Psychologist B also observe the family home environment as well as the care provided to the baby, with the Home Inventory for Families of Infants and Toddlers, Home (Bradley & Caldwell, 1984) and give to the mother a questionnaire to assess problems in the mother-baby pair adaptation and the mother concern with the infant and about the infant difficulties — Questionnaire d'adaptation mère-enfant pour la première année de vie (Lézine, 1964).

Psychologist B also videotape the mother-infant interaction in 3 different contexts: in a structured situation of free play interaction (10 minutes), later rated using a grade purposefully designed by us for this situation, the Observation Grade of Mother-infant Interaction at Home in a situation of Free Interaction, GOISIL (Figueiredo, 1991), in face-to-face interaction (5-8 minutes) and in feeding interaction (5-8 minutes), later rated using Interaction Rating Scales, IRS (Field, 1980).

This whole procedure was repeated twice —at 6 months and at 12 months postpartum.

3. Results

To test group' differences — experimental group/control group — we have carried out T-tests — Wilcoxon's matched-pairs signed-rank test — at 3, 6 and 12 months-data, for the following variables:

a) mother interaction behaviours
b) infant interaction behaviours
c) mother-infant interaction behaviours
d) mother's infant care
e) mother concern with the baby
f) infant behavioural difficulties
g) infant mental and motor development
h) infant behaviour with the observer

3.1. Mother interaction behaviours, infant interaction behaviours, mother-infant interaction behaviours, mother's infant care, and mother concern with the baby

We can point out significant differences between experimental and control groups indicating that at 3, 6 and 12 months postpartum depressed mother's interaction behaviours, as well as the forms how the mother organises the environment and the care of the baby, are less adequate than interaction behaviours and care of mothers with no depressive disorder or other psychiatric morbidity, as you can see in Figures 1, 2 and 3.

(Insert figure 1, 2 and 3)

As you can see in Figures 4, 5 and 6, we can also point out significant differences between experimental and control groups indicating that infant's interaction behaviours of postpartum depressed mother are less adequate — in feeding and face-to-face interaction at 3, 6 and 12 months-old — than interaction behaviours of infants' mothers

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with no depressive disorder or other psychiatric morbidity at 3 months postpartum.

(Insert figure 4, 5 and 6)

At 3, 6 and 12 months postpartum, mother-infant interaction in postpartum depressed mother dyads is less adequate than mother-infant interaction in dyads where the mother is no mentally ill, as you can see in Figure 7.

(Insert figure 7)

As you can see in Figure 8, at 3, 6 and 12 months postpartum, mothers with no depressive disorder or other psychiatric morbidity exhibits much more concern about child's difficulties than 3 months postpartum depressed mothers.

(Insert figure 8)

3.2. Infant behavioural difficulties, infant mental and motor development, and infant behaviour with the observer

Infants of 3 months postpartum depressed mothers have — at 3, 6 12 months-old — more behavioural difficulties than infant's mothers with no depressive disorder or other psychiatric morbidity at 3 months postpartum (see Figure 9).

Figure 10 shows that babies of 3 months postpartum depressed mothers, when compared to control group babies, were evaluated with significant lower motor and mental development rates, at 6 and 12 months.

As it may be noted by an observer, babies' behaviour of 3 months postpartum depressed mothers differ significantly from the behaviour of control group babies. Generally, control group babies are classified in a more positive way than experimental group babies (see Figure11).

(Insert figure 9, 10 and 11).

4. Discussion and Conclusions

Accordingly to the previously stated hypothesis and facing the results we've obtained, we can conclude that the interaction is poorer and less adequate in dyads where the mother is postpartum depressed. For example, mother's facial expression is frequently flat or tense and infant rarely looks at mother in face-to-face interaction, and, in feeding interaction, the mother frequently removes bottle or persists in feeding as infant rejects bottle and the infant frequently squirms and shows head aversion, with significant less mutual eye contact in free play interaction.

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Also, child's home environment and care are significantly more poor and less adequate in homes who the mother is postpartum depressed, and in such case the provision of appropriate play's materials, the verbal and emocional mother's responsivity, and other important aspect of the interaction and the care of the child are negatively affected by the fact the mother is depressed at 3 months postpartum.

Postpartum depressed mothers were found be not emotionally envolved with the baby, not concerned with the baby, not sensibilized with infant's needs and cues, and not presents appropriate events to stimulate infant development, in spite of that they present her-self by negative facial affective expression.

There are a number of adverse effects in infants due to maternal postpartum depression, such as a poorer motor and mental development, a less adjusted behaviour and signs of difficulties of adaptation at 3, 6 and 12 months-old.

We all expected to find that the depressive state would affect the way the mother establishes the relationship with the baby. What we perhaps did not expect was that this would have effects of such a degree and so early in time. As Cohn, Matias, Tronick, Connell, and Lyons-Ruth (1986), we are convinced that the earliest interactions *"are a primary way in which behaviour and personal in which disorders my be transmitted from parent to infant"*. In fact, during these interactions, the baby constructs a first idea about himself and about the world from what he observes on his mother. These earliest interpersonal experiences of the baby with depressed mother left surely some marks on the psychological organisation of the subject, because the reality he comes upon is much different from the reality another child comes upon. We shall try to verify this in he following of our study.

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Figure 1: Mother interaction and care behaviour at 3 months postpartum

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mothers/ 3 months no depressive disorder or other psychiatric morbidity mothers (N=50)

Instrument		Mother interactions and care behaviours	mean rank	mean rank	z	
	SE1	Emotional and verbal responsivity	4.63	8.65	-2.1344	*
H	SE2	Acceptance of child's behaviour	10.10	7.43	-1.1598	
O	SE3	Organisation of physical and temporal environment	9.50	9.50	-1.6549	
M	SE4	Provision of appropriate play materials	9.92	10.14	-0.9658	
E	SE5	Mother involvement with child	11.90	6.50	-1.4589	
	SE6	Opportunities for variety in daily stimulation	7.08	6.93	-0.2097	
	TE	Total Score	12.22	9.58	-2.2401	*
		Feeding position	10.38	9.17	-1.6097	
		State rating	7.04	6.50	-2.7255	**
		Physical activity	6.15	4.50	-2.5340	*
I		Head orientation	4.67	4.00	-1.4003	
R		Gaze behaviour	6.33	4.50	-2.1339	*
S		Contingent vocalisation	9.79	4.50	-3.5276	***
al		Timing of bottle removal	6.15	4.50	-2.5340	*
		Burping	8.75	5.00	-2.5558	*
		Persistence of feeding by mother	11.62	9.00	-3.8147	***
		Summary rating	11.86	4.00	-3.9770	***
		State	7.00	0.00	-3.1798	**
		Physical activity	7.50	0.00	-3.2958	***
		Head orientation	4.67	4.00	-1.4003	
I		Gaze behaviours	1.50	0.00	-1.3416	
R		Facial expressions	5.50	0.00	-2.8031	**
S		Vocalisations	9.56	8.50	-3.3534	***
ff		Silence during infant gaze aversion	8.00	0.00	-3.4078	***
		Imitative behaviours	7.17	5.00	-2.8304	**
		Contingent responsivity	8.18	5.50	-3.0954	**
		Game laying	10.11	8.00	-3.5011	***
		Summary rating	12.90	2.50	-4.0452	***

*p< 0.05
**p< 0.01
***p< 0.001

Figure 2: Mother interaction and care behaviour at 6 months postpartum

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mothers/ 3 months no depressive disorder or other psychiatric morbidity mothers (N=46)

Instrument		Mother interactions and care behaviours	mean rank	mean rank	z	
	SE1	Emotional and verbal responsivity	5.67	8.00	-2.2286	*
H	SE2	Acceptance of child's behaviour	4.50	8.11	-1.9219	
O	SE3	Organisation of physical and temporal environment	6.80	7.13	-0.8037	
M	SE4	Provision of appropriate play materials	9.13	10.84	-2.5573	*
E	SE5	Mother involvement with child	6.50	9.88	-3.1574	**
	SE6	Opportunities for variety in daily stimulation	5.00	7.89	-1.7821	
	TE	Total Score	5.13	12.92	-3.4414	***
		Feeding position	10.67	10.43	-1.5306	
		State rating	6.00	9.08	-2.5854	**
		Physical activity	6.00	7.30	-1.9219	
I		Head orientation	5.50	7.65	-2.9505	**
R		Gaze behaviour	0.00	5.50	-2.8031	**
S		Contingent vocalisation	8.44	7.50	-0.4260	
al		Timing of bottle removal	5.50	7.83	-2.6052	**
		Burping	0.00	5.50	-2.8031	**
		Persistence of feeding by mother	8.63	9.12	-1.9882	*
		Summary rating	4.63	12.50	3.3715	***
		State	0.00	4.00	-2.3664	*
		Physical activity	2.50	5.31	-2.3694	*
		Head orientation	3.50	3.50	-1.4676	
I		Gaze behaviours	0.00	4.50	-2.5205	*
R		Facial expressions	0.00	1.00	-1.0000	
S		Vocalisations	3.50	5.43	-1.8363	
ff		Silence during infant gaze aversion	3.00	5.78	-2.4973	**
		Imitative behaviours	7.50	9.63	-1.8462	
		Contingent responsivity	5.00	7.17	-2.8304	**
		Game laying	7.00	8.15	-2.6126	**
		Summary rating	3.50	13.34	-3.4062	***

*p< 0.05
**p< 0.01
***p< 0.001

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Figure 3: Mother interaction and care behaviour at 12months postpartum

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mothers/ 3 months no depressive disorder or other psychiatric morbidity mothers (N=45)

Instrument		Mother interactions and care behaviours	mean rank	mean rank	z	
H	SE1	Emotional and verbal responsivity	3.50	6.00	-2.0896	*
O	SE2	Acceptance of child's behaviour	7.64	10.68	-1.3936	
M	SE3	Organisation of physical and temporal environment	8.60	6.00	-0.1747	
E	SE4	Provision of appropriate play materials	9.13	10.84	-2.5573	*
	SE5	Mother involvement with child	5.25	6.43	-1.0669	
	SE6	Opportunities for variety in daily stimulation	11.00	8.33	2.9474	**
	TE	Total Score	6.00	10.20	-2.9396	**
		Feeding position	2.50	5.17	-1.8204	
		State rating	3.50	4.08	-1.7748	
		Physical activity	4.00	6.14	-1.5799	
I		Head orientation	3.00	4.75	-0.8452	
R		Gaze behaviour	0.00	2.00	-1.6036	
S		Contingent vocalisation	6.70	6.36	-0.4315	
al		Timing of bottle removal	0.00	3.00	-2.0226	*
		Burping	0.00	1.00	-1.0000	
		Persistence of feeding by mother	4.50	5.25	-1.0662	
		Summary rating	5.50	12.08	-2.4950	*
		State	0.00	4.50	-2.5205	*
		Physical activity	0.00	7.00	-3.1798	**
		Head orientation	0.00	3.50	-2.2014	*
I		Gaze behaviours	0.00	1.50	-1.3416	
R		Facial expressions	4.50	4.50	-1.8904	
S		Vocalisations	0.00	6.00	-2.9341	**
ff		Silence during infant gaze aversion	0.00	6.00	-2.9341	**
		Imitative behaviours	0.00	6.00	-2.9341	**
		Contingent responsivity	0.00	7.50	-3.2958	***
		Game laying	6.50	6.50	-2.5495	*
		Summary rating	0.00	9.50	-3.7236	***

* p< 0.05
** p< 0.01
*** p< 0.001

Figure 4: Infant interaction behaviour at 3 months-old

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=50)

Instrument	Infant interaction behaviours	mean rank	mean rank	z	
	State rating	5.00	5.00	-0.8885	
I	Physical activity	8.63	11.75	-2.5089	*
R	Head orientation	9.25	5.00	-3.3847	***
S	Gaze behaviour	10.00	5.50	-3.2445	**
al	Persistence in feeding	9.76	5.00	-3.5058	***
	Summary rating	11.32	4.50	-3.8581	***
	State	5.00	5.00	-1.4809	
	Physical activity	4.50	0.00	-2.5205	*
I	Head orientation	9.50	0.00	-3.7236	***
R	Gaze behaviour	11.32	8.00	-3.4584	***
S	Facial expressions	8.79	6.50	-2.8440	**
ff	Vocalisations	7.17	5.00	-2.8304	**
	Fussiness	7.67	6.50	-2.4797	*
	Summary rating	12.35	3.00	-3.9121	***

* p< 0.05
** p< 0.01
*** p< 0.001

Figure 5: Infant interaction behaviour at 6 months-old

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=46)

Instrument	Infant interaction behaviours	mean rank	mean rank	z	
	State rating	3.50	3.50	-0.7338	
I	Physical activity	7.67	8.69	-2.3269	*
R	Head orientation	8.21	10.50	-2.4303	*
S	Gaze behaviour	4.00	8.08	-2.7936	**
al	Persistence in feeding	8.83	10.25	-2.6509	**
	Summary rating	6.50	12.06	-3.1108	**
	State	0.00	1.00	-1.0000	
	Physical activity	0.00	4.50	-2.5205	*
I	Head orientation	8.00	8.00	-2.9534	**
R	Gaze behaviour	6.00	7.62	-2.9191	**
S	Facial expressions	5.50	7.83	-2.6052	**
ff	Vocalisations	6.50	7.67	-2.4797	*
	Fussiness	5.83	6.06	-1.3781	
	Summary rating	7.50	10.66	-3.6399	***

* p< 0.05
** p< 0.01
*** p< 0.001

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Figure 6: Infant interaction behaviour at 12 months-old

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=45)

Instrument	Infant interaction behaviours	mean rank	mean rank	z	
	State rating	1.00	0.00	-1.0000	
I	Physical activity	5.67	4.00	-2.3953	*
R	Head orientation	9.06	8.00	-3.2427	**
S	Gaze behaviour	9.13	7.00	-3.2900	***
AI	Persistence in feeding	4.25	2.50	-1.9439	
	Summary rating	10.25	5.50	-3.6017	***
	State	0.00	0.00	0.0000	
	Physical activity	4.50	0.00	-2.5205	*
I	Head orientation	7.00	0.00	-3.1798	**
R	Gaze behaviour	7.65	5.50	-2.9505	**
S	Facial expressions	6.20	4.00	-2.5784	**
FI	Vocalisations	7.25	5.00	-1.4905	
	Fussiness	5.50	0.00	-2.8031	**
	Summary rating	11.28	3.50	-3.6586	***

*p< 0.05
**p< 0.01
***p< 0.001

Figure 7: Mother-infant interaction behaviours at 3, 6 and 12 months postpartum

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=50)

Instrument		mother infant interaction behaviours	mean rank	mean rank	z	
	IRS	face-to-face interaction	5.00	12.32	-4.0452	***
		feeding interaction	4.00	11.86	-3.9770	***
3	GOISIL	mutual eye contact	10.91	11.38	-2.4330	*
		mutual attention in physical world	10.00	10.83	-0.9333	
		mutual vocalisation	1.00	2.00	-0.4472	
	IRS	face-to-face interaction	3.00	9.88	-3.5929	***
		feeding interaction	4.10	13.68	-3.4414	***
6	GOISIL	mutual eye contact	8.50	10.40	-2.4548	*
		mutual attention in physical world	6.25	10.50	-1.8462	
		mutual vocalisation	0.00	1.50	-1.3416	
	IRS	face-to-face interaction	1.50	10.97	-3.8639	***
		feeding interaction	3.00	11.82	-3.5839	***
12	GOISIL	mutual eye contact	5.50	10.46	-2.3196	*
		mutual attention in physical world	6.83	10.18	-1.6805	
		mutual vocalisation	2.00	3.00	-0.3651	

*p< 0.05
**p< 0.01
***p< 0.001

Figure 8: Mother concern with the baby at 3, 6 and 12 months postpartum

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=50)

Infant age	Mother preoccupation	mean rank	mean rank	z	
3	nourishment	4.50	10.38	-2.7693	*
m	sleep	8.00	10.92	-1.8914	
o	cleanness	7.10	8.45	-1.3915	
n	health	9.50	9.50	-2.8961	**
t	fears	10.08	12.68	-2.3572	*
h	mobility	6.40	10.08	-2.1065	*
s	total	3.33	13.30	-3.8931	***
6	nourishment	5.50	9.19	-2.6630	**
m	sleep	7.50	12.12	-1.9600	*
o	cleanness	8.31	9.61	-0.4734	
n	health	6.00	8.50	-2.3854	*
t	fears	7.86	11.92	-1.8666	
h	mobility	6.17	8.46	-2.3570	
s	total	4.83	10.97	-3.2395	**
12	nourishment	8.50	7.92	-2.4422	*
m	sleep	6.30	8.85	-1.6187	
o	cleanness	10.06	9.95	-0.5835	
n	health	6.25	7.14	-2.3062	*
t	fears	9.17	11.73	-2.1028	*
h	mobility	7.00	7.00	-0.7338	
s	total	8.30	11.23	-2.3706	*

*p< 0.05
**p< 0.01
***p< 0.001

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Figure 9: Infant behavioural difficulties at 3, 6 and 12 months-old
Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=50)

Infant age	Behavioural difficulties	mean rank	mean rank	z	
3	nourishment	10.36	6.50	-1.7752	
m	sleep	7.83	8.90	-1.0859	
o	cleanness	8.50	8.50	0.0000	
n	health	9.88	10.25	-1.3481	
t	fears	8.00	10.67	-1.8615	
h	mobility	9.50	7.50	-0.4137	
s	total	12.47	10.67	-2.2507	*
6	nourishment	9.50	5.00	-1.9879	*
m	sleep	11.79	9.94	-0.9037	
o	cleanness	7.25	7.83	-0.3453	
n	health	10.54	9.07	-1.2676	
t	fears	10.40	9.56	-0.3622	
h	mobility	7.25	6.17	-1.8869	
s	total	15.10	8.50	-0.7954	
12	nourishment	6.36	6.70	-0.4315	
m	sleep	10.18	8.43	-1.1541	
o	cleanness	9.05	5.13	-2.2434	*
n	health	11.94	8.25	-0.5030	
t	fears	8.86	9.10	-0.6864	
h	mobility	3.50	5.43	-1.8363	
s	total	11.23	10.63	-1.0601	

*p< 0.05
**p< 0.01
***p< 0.001

Figure 10: Infant development at 3, 6 and 12 months-old
Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=50)

Infant age	Scale	mean rank	mean rank	z	
3 months	Bayley — Mental scale	15.90	9.00	-0.6387	
	Bayley — Motor scale	11.73	9.61	-1.2860	
	Bayley — Total scale	11.73	8.50	-0.0647	
6 months	Bayley — Mental scale	10.46	10.56	-0.7653	
	Bayley — Motor scale	10.22	8.83	-2.7566	**
	Bayley — Total scale	11.03	10.92	-1.7379	
12 months	Bayley — Mental scale	11.00	9.00	-2.1028	*
	Bayley — Motor scale	11.73	9.17	-2.1028	*
	Bayley — Total scale	11.59	9.10	-2.4330	*

*p< 0.05
**p< 0.01
***p< 0.001

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Figure 11: Infant behaviour at 3, 6 and 12 months postpartum

Wilcoxon's matched-pairs signed-rank test: 3 months postpartum depression mother/ mothers with no depressive disorder or other psychiatric morbidity (N=50)

Infant age	Infant behaviour	mean rank	mean rank	z		Infant behaviour	mean rank	mean rank	z	
	responsiveness to persons	9.00	10.46	0.0990		reactivity	7.50	9.82	-1.4912	
3	responsiveness examiner	6.00	8.33	-1.4125		sights-looking	12.00	8.54	-1.1105	
	responsiveness to mother	5.00	6.80	-2.2749	*	listening to sounds	7.70	9.83	-0.4654	
m	cooperativeness	10.67	9.40	-0.0402		producing sounds	7.29	10.20	-1.2071	
o	fearfulness	7.25	8.86	-0.1136		banging	8.38	9.82	-2.2646	*
n	tension	11.88	12.07	-1.3078		manipulating	8.25	12.00	-1.4560	
t	emotional tone	8.50	11.58	-1.6986		body motion	10.43	9.75	-0.8853	
h	object orientation	7.17	11.83	-0.9146		mouthing or sucking	11.88	11.42	-2.5648	*
s	imaginative play	2.50	2.50	-0.9129		pacifier	12.88	10.71	-0.7629	
	persistent attachment toy	1.00	0.00	-1.0000		toys	9.73	14.08	-0.9429	
	goal directness	9.71	10.17	-1.0865		energy	8.79	9.95	-1.0452	
	attention span	9.61	12.07	-1.0080		gross coordination	10.22	7.75	-0.0473	
	endurance	9.89	9.11	-1.1524		fine coordination	4.67	4.00	-0.1207	
	activity	8.31	11.96	-1.4373						
	responsiveness to persons	7.86	9.00	-0.6722		reactivity	7.33	7.55	-1.9147	
6	responsiveness examiner	4.50	7.75	-2.2363	*	sights-looking	8.28	10.72	-0.4791	
	responsiveness to mother	5.50	6.59	-2.6280	**	listening to sounds	6.80	9.92	-2.0119	*
m	cooperativeness	8.92	10.50	-1.6701		producing sounds	13.00	11.06	-1.9966	*
o	fearfulness	10.04	11.19	-0.5787		banging	6.90	14.10	-1.3440	
n	tension	8.15	7.70	-1.2211		manipulating	10.13	11.54	-1.1991	
t	emotional tone	10.08	10.68	-1.6613		body motion	9.17	11.59	-0.8400	
h	object orientation	7.75	10.38	-1.6985		mouthing or sucking	6.63	9.73	-2.3669	*
s	imaginative play	1.50	1.50	0.0000		pacifier	6.50	9.71	-0.4544	
	persistent attachment toy	0.00	2.50	-1.8257		toys	8.25	8.75	-0.1034	
	goal directness	8.56	12.50	-1.6336		energy	8.25	5.93	-0.2795	
	attention span	8.00	9.31	-2.1065	*	gross coordination	8.25	8.75	-0.1034	
	endurance	9.90	10.04	-1.8310		fine coordination	8.25	5.93	-0.2795	
	activity	10.90	9.68	-1.6298						
	responsiveness to persons	7.13	6.80	-0.8037		reactivity	8.17	8.70	-0.9825	
	responsiveness examiner	8.67	8.40	-0.8273		sights-looking	7.89	9.29	-0.1551	
12	responsiveness to mother	5.00	8.46	-2.8398	**	listening to sounds	8.29	9.50	-0.8758	
	cooperativeness	13.50	9.50	-1.4000		producing sounds	7.79	9.85	-1.0414	
m	fearfulness	10.60	7.75	-2.5755	**	banging	7.17	11.83	-0.9146	
o	tension	9.54	5.38	-2.4045	*	manipulating	10.22	10.73	-0.4853	
n	emotional tone	7.70	9.54	-1.7988		body motion	13.14	9.93	-0.8168	
t	object orientation	7.13	6.19	-0.8237		mouthing or sucking	8.00	10.08	-1.9815	*
h	imaginative play	1.50	1.50	0.0000		pacifier	7.89	10.25	-0.2604	
s	persistent attachment toy	2.00	2.00	-0.5345		toys	12.96	9.39	-1.3636	
	goal directness	7.30	7.61	-1.0044		energy	7.00	9.43	-2.6273	**
	attention span	8.80	7.60	-0.9087		gross coordination	10.79	7.80	-2.2536	*
	endurance	10.50	9.12	-1.4372		fine coordination	7.50	7.50	0.0000	
	activity	10.13	9.32	-1.9598	*					

* p< 0.05
** p< 0.01
*** p< 0.001

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